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HIGH SCHOOLS THAT WORK

Pre-Conference Workshop: Redesigning Career/Technical Courses to Align with the Common Core State Standards

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Content of Redesigned Career/Technical Courses

Career/Technical Knowledge and Skills:

This represents the principle content that will be use to create a CTE course. They include the core technical skills to be competent in a given occupational area. **Industry-validated standards** are one source of career/technical knowledge and skills. Industry standards are developed by industry experts that actually perform the technical skills on the job. They outline workplace tasks, competencies, or standards depending on the format, but they are usually validated by the business and industry work-force through a process such as Instructional Systems Design or DACUM. These processes involve analyzing the occupation or jobs within the field to determine the knowledge and skills necessary to perform successfully. Industry standards provide the framework for certifying CT programs so that students can receive industry credentials if they are available in the field.

A good resource (http://online.onetcenter.org/) to help you better understand industry standards or occupational data is through the U.S. Department of Labor's O*NET system, the nation's primary source of occupational information. O*NET offers comprehensive information on key attributes and characteristics of workers and occupations. In the O*NET database, you can access information on occupations, skills, technology and tools.

Another source for career/technical knowledge and skills are **state-developed CT standards.** While states vary in the process of developing their CT standards, these sets of knowledge and skills are usually validated by state panels of employers representing various CT career fields and educators within those field. State CT standards usually indicate where the state academic standards align to the career/technical knowledge and skills. This alignment helps CT teachers understand the academic knowledge and skills they need to include when they teach particular CT courses.

Some states validate the industry standards as their adopted state CT standards so that they align with national credentialing assessments or the certifying body. The process starts with a review of existing industry standards. Professionals involved in this process include business and industry representatives, secondary teachers, and state career/technical program area supervisor or director. The key point is that when industry standards are aligned to state CT standards, they must be defined in a way that will enable students to complete their courses with the knowledge and skills required in business and industry. Once the industry standards are identified and adopted, they are aligned to state academic standards, usually in language arts, mathematics, and science, though other academic areas may also be included. As a final step, the state curricula may also include sample programs of study to meet the guidelines of Perkins IV.

Academic Standards:

Academic standards outline what students should know and be able to do in a variety of academic areas. Many states have adopted the Common Core State Standards for students in grades K-12 in the areas of reading and writing (sometimes referred to as English or Language Arts) and mathematics. Common Core State Standards for science are expected to be released soon. States may also mandate assessments that schools must administer to determine whether students have met the standards. Federal legislation requires each state to measure mathematics and reading proficiency to determine whether students are making adequate progress toward proficiency in these areas. Assessments related to the Common Core State Standards are being developed. Perkins IV legislation calls for a strong emphasis on academically rigorous content in CT programs. Because CT students must enroll in and successfully complete academic courses in order to graduate from our CT programs, integrating academics into CT courses has become critical for all CT teachers.

21st Century Skills

21st Century Skills are the skills, knowledge and expertise students should master to succeed in work and life in the 21st century. These skills provide a common foundation of that is fundamental to success in all workplace environments. The skills are also necessary for further learning beyond high school. There are a number of skill sets that have been developed to outline these skills including the Essential Knowledge and Skills of the States Career Cluster Initiative (www.careerclusters.org). A more recent development is The Framework for the 21st Century Skills (www.21stcenturyskills.com). The categories for this framework are listed below:

- Core Subjects and 21st Century Themes
- Learning and Innovation Skills
- Information, Media and Technology Skills
- Life and Career Skills

All Aspects of an Industry

All Aspects of An Industry is mentioned in the Perkins legislation, which calls for "strong experience in and understanding of those aspects of industry the students are preparing to enter." These aspects include planning, management, finance, technical and production skills, principles of technology, labor issues, community issues, and health, safety and environment issues. All Aspects of an Industry explores the context in which technical skills are taught and used. For example, automotive technology is taught as part of the transportation cluster. In addition to the specific skills needed for that particular occupation, learners are shown the "Big Picture" of the industry and learn technology, communication, and health and safety issues important to the transportation industry as a whole.

> "We should be able to look at every CTE program in your state and answer how many students graduate from high school and transition successfully into and complete at least one year of postsecondary education or training. If a program cannot deliver these outcomes or provide these data, then we should re-tool it."
>
> U. S. Secretary of Education Arne Duncan in his address to the National Association of State Directors of Career Technical Education Consortium and the Office of Vocational and Adult Education
>
> April 19, 2011

read the full address!

What are the Academics to be Embedded in Redesigned Career/Technical Courses?

Directions: As a team, review the format of the Common Core State Standards for English/Language Arts. Notice each section begins with Anchor Standards, divided in categories, and is followed by an explanation of what students should understand and be able to do by the end of each grade 6-12. Discuss what you see using the questions below.

English/Language Arts: What are the standards?

- Common Core State Standards: College and Career Readiness Anchor Standards for Speaking and Listening (See excerpted pages from the Common Core State Standards, pages 48-50)

- Common Core State Standards: College and Career Readiness Anchor Standards for Reading (See excerpted pages from the Common Cores State Standards, "Reading Standards for Literacy in Science and Technical Subjects 6-12," pages 60 and 62)

- Common Core State Standards: College and Career Readiness Anchor Standards for Writing (See excerpted pages from the Common Core State Standards, "Writing Standards for Literacy in History/Social Studies, Science and Technical Subjects 6-12," pages 63-66)

Discussion Questions:

1. What are the categories under each of the Anchor Standards for Speaking and Listening, Reading and Writing? Jot down the categories.

2. After reviewing the English/Language Arts standards for Speaking and Listening, Reading and Writing, how comfortable do you think you are with teaching this content in your CT course? What standards would give you the most difficulty? Brainstorm with your team ways you might improve your confidence and what the school might do to help?

Mathematics: What are the standards?

- Common Core State Standards for Mathematics: Standards for Mathematical Practice (see excerpted pages from Common Core State Standards, Mathematics Standards for Mathematical Practice, pages 6-46)
- Common Core State Standards for Mathematics: Grade 7 Overview (see excerpted pages from Common Core State Standards Mathematics, pages 48-51)
- Common Core State Standards for Mathematics: Grade 8 Overview (see excerpted pages from Common Core State Standards Mathematics, pages 52-56)
- Common Core State Standards for Mathematics: Mathematics Standards for High School (see excerpted pages from Common Core State Standards Mathematics (pages 58-90)

Discussion questions:

1. Which Standards for Mathematical Practice make the most sense for the career/technical educator? Why?

2. It has been said that most mathematics currently embedded in career/technical programs is just middle grades mathematics? After reviewing the middle grades mathematics standards for Grade 7 and 8 and considering your current career/technical program(s), would you say that was correct? Why?

3. After reviewing the Mathematics Standards for High School, how comfortable do you think you are with teaching this content in your CT course? What standards would give you the most difficulty? Brainstorm with your team ways you might improve your confidence and what the school might do to help?

Science: What are the standards?

- National Research Council: National Science Education Standards
- Science and Engineering—Comparison

Discussion Questions:

1. What is the difference between A.1. Abilities Necessary to do Scientific Inquiry and E.1. Abilities of technological design?

2. What is the difference between the scientific practices and engineering design?

3. After reviewing the National Research Council National Science Education Standards, how comfortable do you think you are with teaching this content in your CT course? What standards would give you the most difficulty? Brainstorm with your team ways you might improve your confidence and what the school might do to help?

Redesigning CT Courses around Project-Based and Problem-Based Learning

Project-based learning (PBL) is an instructional model that organizes learning around projects—complex tasks based on challenging problems or questions. Through PBL, students are engaged in design, problem-solving, decision-making, or investigative activities that give them the opportunity to direct their own learning and that result in a product or presentation (Thomas, Mergendoller, & Michaelson, 1999). While projects may vary in duration and scope, recent definitions of PBL recognize that good projects are standards-focused, engaging students in "learning knowledge and skills through an extended inquiry process structured around complex, authentic questions and carefully designed products and tasks" (Buck Institute for Education, 2007).

In career/technical education, PBL is used to bring an authentic, motivating context to teaching career-related competencies. A career/technical project may involve workplace simulations such as designing, assembling, testing, or evaluating a product; developing and/or implementing a plan to meet a local business need; or operating a business in the school or community (Bottoms, Pucel, & Phillips, 1997). Projects usually require a series of steps and provide opportunities to make judgments and decisions when unexpected events occur, typical conditions found on the job. Most importantly, projects teach students to resolve workplace problems, fostering the development of the essential problem-solving skills needed for the workplace.

The varying nature and depth of PBL implementation complicates the research base on its effectiveness as an instructional method. Projects vary widely in the depth of the content covered, duration, and the degree to which they are student-directed. Teachers site a variety of reasons for *not* using projects, including lack of time, resources, and technology. In spite of these limitations, Thomas' (2000) comprehensive review of research on PBL found some evidence that the approach enhances the quality of student learning when compared with other instructional methods. PBL has the potential to help students learn not only subject matter content, but the ability to put that content to use in real-life situations to solve problems and make decisions. This goal is particularly important in career/technical classrooms since students are solving problems and completing projects similar to those they will face as they enter and advance in the workplace.

PBL teaches students complex processes and procedures such as planning and communicating and leads to higher-level cognitive development through active engagement with complex situations (Buck Institute for Education, 2007). Teachers report that PBL:

- Helps bridge the gap between "knowing and doing," or knowledge and thinking.
- Encourages the development of habits of mind associated with learning throughout life, civic responsibility, and career success.
- Assesses performance on content and skills using criteria similar to those in the work world, thus encouraging accountability, goal setting, and improved performance.
- Creates positive communication and collaborative relationships among diverse groups of students.
- Meets the needs of learners with varying skill levels and learning styles.
- Engages and motivates students who are typically unmotivated (Buck Institute for Education, 2007).

In order to successfully implement PBL and reap its benefits as an instructional strategy, Thomas (2000) offered a set of characteristics that should be present:

- *Projects must be central, not peripheral to the curriculum.* In a PBL instructional approach, projects represent the central learning concepts, knowledge and skills of the subject. In career/technical education, that means selecting projects that enable students to learn career competencies. Problem-based learning specifically draws problems and scenarios exclusively related to the career field (Bottoms, Pucel, & Phillips, 1997).

- *Projects are focused on questions or problems that lead students to learn the central concepts and principles of a discipline.* Teachers are challenged to define projects so that the learning activities connect to the concepts and skills that the students are expected to learn. This can be accomplished with an essential question or, in the case of problem-based learning, an ill-defined problem. Thomas (2000) warns that PBL projects may be built around thematic units or the intersection of topics from two or more disciplines, but that is not sufficient to define a project. The questions that students pursue, as well as the activities, products, and performances that occupy their time, must be designed to achieve an important purpose.

- *Projects involve students in a constructive investigation.* An investigation is goal-directed, involving inquiry, knowledge-building, and resolution. In order to be considered as a PBL project, the activities that are central to the project must lead students to construct their own knowledge (new understanding, new skills). If the project activities are of no difficulty to the student or the project can be accomplished without the application of already-learned information or skills, the project is an exercise, not a PBL project.

- *Projects are student-driven to some significant degree.* PBL projects are not highly prescribed nor structured to be led by the teacher. Laboratory exercises and learning packets are not examples of PBL, even if they are problem-focused and central to the curriculum. PBL projects allow for more student autonomy, choice, and student accountability than traditional instruction and traditional projects.

- *Projects are realistic, not school-like.* Projects embody characteristics that give them a feeling of authenticity. In career/technical education, the projects are drawn from major activities exclusively related to the career field. They should represent the culminating activities of large units of study rather than narrow sub-skills or tasks.

Problem-based learning is closely related to project-based learning in that both involve complex tasks that engage students in planning, gathering and evaluating information, analyzing situations and developing solutions. The difference between the two lies in the specific aspects of delivery. Problem-based learning begins with an ill-defined problem and asks the student to hypothesize how to solve it (Delisle, 1997), which cannot be said of all projects. Once the problem is defined, students access, analyze, and use data and information from different sources, revise the initial hypotheses as needed, and develop and justify solutions according to evidence and reasoning (Barrows, 1986; Gallagher, Stepian, Sher & Workman, 1995). The problem-based learning approach, used in medical schools to develop clinical reasoning, is outlined by Barrows and Tamblyn as follows:

1. The problem is encountered first in the learning sequence, before any preparation or study has occurred.
2. The problem situation is presented to the student in the same way it would present in reality.
3. The student works with the problem in a manner that permits his or her ability to reason and apply knowledge to be challenged and evaluated, appropriate to his or her level of learning.
4. Needed areas of learning are identified in the process of work with the problem and used as a guide to individualized study.

5. The skills and knowledge acquired by this study are applied back to the problem, to evaluate the effectiveness of learning and to reinforce learning.
6. The learning that has occurred in work with the problem and in individualized study is summarized and integrated into the student's existing knowledge and skills (1980, pp. 191–192).

Since it is driven by authentic situations, problem-based learning is both rigorous and relevant, engaging students in a highly participatory learning experience. Students become interested in the problem they are solving and are more motivated to learn. Through their active engagement in the learning process, students take responsibility for their own learning and are better able to define topics, access resources, and evaluate the validity of those resources (Gallagher et al., Krynock & Robb, 1996). Sungar and Tekkaya (2006) conducted a quasi-experimental study of two biology classrooms, one taught with teacher-centered, textbook-oriented traditional instruction and the other with problem-based learning. The students who received problem-based learning had higher levels of critical thinking, metacognition, and effort than the students taught with traditional methods. The biggest impact, however, was observed on the students' ability to self-regulate their own learning, actively sustaining their thoughts, behaviors, and emotions to reach their goals. Other studies have shown problem-based learning to improve critical thinking, communication, mutual respect, team work, and interpersonal skills (Achilles & Hoover, 1996; Gordon, Rogers, Comfort, Gavula & Mcgee, 2001; McBroom & McBroom, 2001; Sage, 1996; Savoie & Hughes, 2004; West, 1992). Problem-based learning has significant potential to teach the kind of skills that career/technical students will need to succeed in further learning and the workplace.

John Mergendoller of the Buck Institute for Education asserts (personal conversation, February 2009) that designing project- or problem-based learning presents a real design challenge to teachers, and certainly to career/technical teachers entering the field under the challenges and limitations of an alternative certification program. The Buck Institute is currently using a project planning form that can be helpful. The goal of the form is to help teachers see project-based learning as an "envelope" into which all other strategies fit—to help students really learn how problems and questions can drive learning and help them take well-thought-out, effective action in response to real-life situations. Given the nature of career/technical education content, it is likely that most, if not all, units of study may be planned with a driving project or problem. If real workplace problems, questions, or scenarios drive student learning, students are much more likely to reap the benefits of this strategy—problem-solving and higher order thinking skills, as well as the ability to regulate their own learning throughout life.

Redesigning career/technical courses using project/problem-based curriculum with integration of content from the Common Core State Standards provides students who need a hands-on approach to learning the opportunity to master rigorous college- and career-ready content in a hands-on and heads-on approach. Career technical has been shown to engage students in school by exposing them to skills and activities that are directly applicable in the "real world" (Berns & Erickson, 2001). CT often uses project-based learning (PBL), an instructional model that organizes learning around projects—complex tasks based on challenging problems or questions—and has been shown to affect students' motivation, attitudes toward learning, and habits of success (Thomas, 2000). PBL starts with a problem or situation that requires students to acquire new knowledge and skills. Teachers help students to identify what they know and what they need to know and guide their learning and application of new knowledge. Through PBL, students are engaged in design, problem-solving, decision-making, or investigative activities that give them the opportunity to direct their own learning and complete a product or presentation to address a problem or question (Thomas, Mergendoller, & Michaelson, 1999). Aligning technical content with academic standards infuses CT courses with academic rigor that becomes relevant for students and can lead to increased understanding and performance (Stone, Alfeld, & Pearson, 2008).

References

Achilles, C.M., & Hoover, S.P. (1996). Exploring problem-based learning in grades 6-12. Paper presented at the annual meeting of the Mid-South Educational Research Association, Tuscaloosa, AL.

Barrows, H.S. (1986). A taxonomy of problem-based learning methods. Medical Education, 20, 481-486.

Barrows, H.S., & Tamblyn, R. M. (1980). Problem-Based Learning: An Approach to Medical Education. New York: Springer Publishing Company.

Berns, R., & Erickson,, P. (2001). Contextual teaching and learning: Preparing students for the new economy. The Highlight Zone: Research @ Work. Columbus, Ohio: Ohio State University, National Dissemination Center for Career and Technical Education. (Issue no. 5)

Bottoms, G., Pucel, D.J., & Philips, I. (1997). Designing Challenging Vocational Courses. Atlanta, GA: Southern Regional Education Board.

Buck Institute for Education (2007). Handbook: Project-Based Learning. Novato, CA: Author. http://www.bie.org/index.php/site/PBL/pbl_handbook/

Delisle, R. (1997). How to Use Problem-Based Learning in the Classroom. Alexandria, VA: Association for Supervision and Curriculum Development.

Gallagher, S.A., Stepian, W. J., Sher, B. T., & Workman, D. (1995). Implementing problem-based learning in science classrooms. School Science and Mathematics, 95, 136-146.

Gordon, P. R., Rogers, A. M., Comfort, M., Gavula, N., & McGee, B. P. (2001). A taste of problem-based learning increases achievement of urban minority middle-school students. Educational Horizons, 79, 171-175.

Krynoch, K. B., & Robb, L. (1996). Is problem-based learning a problem for your curriculum? Illinois School Research and Development Journal, 33, 21-24.

McBroom, D.G., & McBroom, W.H. (2001). Teaching molecular genetics to secondary students: An illustration and evaluation using problem-based learning. The Problem Log, 6, 2-4.

Sage, S.M. (1996). A qualitative examination of problem-based learning at the K-8 level: Preliminary findings. Paper presented at the annual meeting of the American Educational Research Association, New York.

Savoie, J.M., & Hughes, A.S. (1994). Problem-based learning as classroom solution. Educational Leadership, 52, 54-57.

Thomas, J.W. (2000). A review of research on project-based learning. San Rafael, CA: Autodesk Foundation.

Thomas, J. W., Mergendoller, J. R., and Michaelson, A. (1999). *Project-based learning: A handbook for middle and high school teachers*. Novato, CA: The Buck Institute for Education.

Problem-based curriculum boosts high school students' knowledge of economics

REL West conducted a randomized control trial in two Western states that examined the effects of a problem based high school curriculum on students' proficiency in economics. The study, *Effects of Problem Based Economics on High School Economics Instruction*, was released by the National Center for Education Evaluation and Regional Assistance. It found a significant positive impact for students of teachers who received receive professional development and support in Problem Based Economics compared with their peers.

• The students whose teachers used the problem based curriculum in their classrooms scored significantly higher on measures of problem-solving skills and their application to real-world economic dilemmas when compared to students who were not exposed to the curriculum in their economics classes. The impact was measured using the Test of Economic Literacy, a widely accepted, standards-aligned test used across the United States to measure economic literacy among high school students.

• The economics teachers who used the problem based approach were significantly more satisfied with the materials and methods than their peers who did not use the curriculum. However, there were not statistically significant differences between the two groups of teachers on measures of economic content knowledge. Also, based on survey findings, no differences were found between the two groups on classroom-teaching practices. For more information, see the report at http://ies.ed.gov/ncee/edlabs/projects/project.asp?ProjectID=89.

Is the project large enough to cause students to acquire major technical, academic and personal skills?

Does the project require students to interact and share ideas about addressing the problem?

Does the project require students to organize information, consider alternatives and use higher-order thinking skills?

Does the project require students to apply academic skills that are most needed to advance in the field and to participate in postsecondary training or education?

How would you improve the project?

Fundamentals of Aerospace Technology: You are a trainer in a flight school. Before your students learn how to operate an aircraft and understand its instrumentation, they must learn basic dynamics of flight. Key to understanding basic flight dynamics is the understanding of Bernoulli's principle.

Working with a team of three you will conduct research on Bernoulli's principle to learn who created it, how it helps to explain how an airplane lifts off the ground, and when and how to use Bernoulli's equation. You will conduct scientific investigations which will help you understand Bernoulli's principle and its effect on flight. Investigations will include experiments to demonstrate the effects of high and low pressure on the lift of an object. You must be able to explain, using appropriate terminology, how airplanes fly and how aircraft wings are designed with Bernoulli's principle in mind. Data will be gathered from all scientific investigations, analyzed and reported. You will apply Bernoulli's equation. You will create a write a script for and produce a video presentation which explains Bernoulli's principle to your flight school class. The video presentation will be posted to YouTube and must explain Bernoulli's principle, show your group conducting a demonstration of one of the scientific investigations your group conducted and will detail how mathematics and science concepts were applied during the investigations. You will maintain an electronic portfolio which includes: class lecture notes; research notes; notes from scientific investigations including testable hypothesis, lab notes and analysis of data collected from the investigations; examples of mathematics problems requiring calculations of Bernoulli's principle to explain flight dynamics; the written script along with copies of storyboards for the video presentation; your group video presentation; and, daily written reflections on what you have learned about the Fundamentals of Aerospace Technology.

Is the project intellectually demanding?

Does the project provide opportunities for students to practice rigorous technical and academic concepts?

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How would you improve the project?

Culinary Arts: You are the quality assurance manager for a candy company. Your plant produces candies with and without peanuts. You are faced with the task of developing procedures to avoid cross-contamination of peanut free candies with peanuts at levels causing allergic reactions. You must identify required procedures and institute a quality-assurance program which ensures that cross contamination does not occur. Research peanut allergies and the handling of peanuts and equipment. Prepare a written protocol to address peanut contamination and present training to your colleagues to acquaint them with the recommended procedures.

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How would you improve the project?

Design and Build a Lifting Device (Pre-Engineering): Students in a special employment program for special needs at Texas High School, Anytown, TX run a school-wide paper recycling project. The problem is they must lift papers from a 326 pound container into a dumpster. In order to make this job easier for the physically disabled students, you will work in groups to design a mechanical lift to dump the 326 pound containers into the dumpster. You will make use of geometric concepts such as triangle similarity, trig, ratios, solid figure similarity, angle relationships, properties of plane and solid figures, congruent figures and the Pythagorean Theorem. The mechanical, or physics, concepts include force, mass, friction, velocity and acceleration, Newton's second law, dynamics, and pendulum motion. In order to use these mechanical concepts in completion of the lift, students must also understand how to solve proportions, equations, and summations. Using these geometric and mechanical concepts, you will design and produce technical drawings in Auto CAD. You will then build models and a prototype of a pneumatic lift ladder with a rolling slide and mechanical gears. Since the biggest concerns in this project is cost and safety, the design must include considerations for keeping the container secure and build a receptacle latch and safety locking devises. Members of the business community will attend to advise you, and field trips will be made to NASA Behind the Scenes, the Houston Natural Science Museum, and KBR Engineering to assist in the design process.

Is the project intellectually demanding?

Does the project provide opportunities for students to practice rigorous technical and academic concepts?

Is the project large enough to cause students to acquire major technical, academic and personal skills?

Does the project require students to interact and share ideas about addressing the problem?

Does the project require students to organize information, consider alternatives and use higher-order thinking skills?

Does the project require students to apply academic skills that are most needed to advance in the field and to participate in postsecondary training or education?

How would you improve the project?

Designing a Food Plot (Agriculture): Learning to manage wildlife by planting food plots, creating areas for cover and providing water and arrangement is an important skill for successful agriculture management. In this project, you will use technical and academic knowledge and skills to design a scale model of a food plot including the preparation of a budget for creating the plot and justifying the importance of the plot as it relates to the costs of managing crop acreage. Select and research the wildlife you intend to target, determine the size of the food plot needed by the wildlife and best practices in the technical field. Research should also include best practices in providing cover, water and arrangement of plot components. Contact the local co-op to determine food and fertilizer prices. You are required to show all mathematics used in producing the scale model, including ratio and proportions and equations used for calculating food plot costs. You are required to describe ecological and biological concepts used in consideration of food plot choices. Submit an essay justifying all choices as well as the expense of your food plot based upon the proportion of your land used for the food plot.

Is the project intellectually demanding?

Does the project provide opportunities for students to practice rigorous technical and academic concepts?

Is the project large enough to cause students to acquire major technical, academic and personal skills?

Does the project require students to interact and share ideas about addressing the problem?

Does the project require students to organize information, consider alternatives and use higher-order thinking skills?

Does the project require students to apply academic skills that are most needed to advance in the field and to participate in postsecondary training or education?

How would you improve the project?

Banking and Finance: This project requires students to make a prediction about the type of investment account they would choose for themselves. Using cooperative groups and a jigsaw activity, students research and teach other students about different types of interest-bearing accounts. Students obtain current account and interest information from local financial institutions. Students prepare a graph depicting interest earned from investing $1,000 in each type of account studied. Students are required to factor in variables such as liquidity, length of deposit, interest returned, etc.. Students then gauge the appropriateness of their predictions based on the actual results to determine whether or not